LEAP: One Alternative to WAP

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1 Introduction

Over the last few years, data communications has expanded dramatically and forcefully into the wireless environment. A major new Internet reality is that of wireless networks, providing service to legions of miniaturized, hand-held mobile devices. This reality has placed an entirely new set of requirements on the underlying communications protocols: they must now provide the power efficiency demanded by hand-held wireless devices, together with the bandwidth efficiency demanded by wide area wireless networks.

Existing Internet protocols do not adequately meet these requirements. Therefore a new generation of efficient protocols are needed, to satisfy the demands of wireless applications. At some point, the wireless data communications industry must agree on a single set of protocols that satisfies its requirements.

1.1 The WAP Trap

In April 1998, a business association called the WAP Forum published the **Wireless Application Protocol**, or **WAP**. WAP is a set of specifications for wireless data communications using hand-held devices such as mobile phones and palmtop computers. The WAP specification provides the users of these devices with mobile data communications capabilities such as web-browsing and e-mail.

The WAP specification purports to be an open, license-free protocol that will unify and promote the growth of the wireless industry. The WAP Forum claims that the WAP specification satisfies all the requirements necessary to become the industry standard, and is aggressively promoting it as such.

In a previous article entitled *The WAP Trap* [4], however, we have argued that WAP is utterly unfit for its claimed purpose. In that article we described the desirable characteristics of enduring, industry-building protocols, and we demonstrated that the WAP protocols lack all of them.

Among other things we showed that WAP is the result of a closed design process within a members-only club, that it remains tightly controlled by the WAP Forum, is crippled by patent restrictions, and is riddled with technical design errors.

Our conclusion was that the WAP specification is not a genuine engineering construct; it is a bogus marketing one. Its purpose is to create unfair market advantage and bring short-term financial gain to its developers, rather than to provide long-term benefit to the industry at large and the consumer. Far from being an enabling force in the wireless industry, WAP is a poorly-designed red herring created by narrow business self-interests.

In the long run WAP cannot survive as a viable solution. In the short run, however, it can do considerable harm to the industry and the consumer.

In *The WAP Trap* we went on to discuss the steps that can be taken to prevent this harm. A crucial step will be for the industry to adopt an alternative to WAP as soon as possible. We concluded the article by presenting one alternative: LEAP, the Lightweight and Efficient Application Protocol.

1.2 About this Document

In the present article, we will carry on where the previous article left off. The scope of *The WAP Trap* was limited to a critique of WAP, without actively promoting any particular alternative. The present article, on the other hand, is frankly partisan; our purpose here is to promote LEAP as a candidate for the industry standard.

The authors of this article are members of the Free Protocols Foundation (FPF), under whose auspices this article is being written. The mission of the FPF is to provide support for the development, maintenance, and promotion of patent-free protocols and software. It provides a forum in which developers can declare publicly that the protocols and/or software they have developed are intended to be patent-free, and that it is their intention to keep them permanently patent-free.

In addition, where the existence of patented components within protocols and/or software threatens their unrestricted usage and implementation, the FPF supports the promotion of patent-free alternative protocols and/or software. It is for this purpose that the current article is being written: to promote LEAP as a patent-free alternative to WAP.

In this article we will describe LEAP from both a technical and a procedural point of view. We will compare it to WAP, and will demonstrate that it has all the desirable characteristics of an industry standard protocol that WAP lacks. Our conclusion will be that LEAP is destined to become the basis for an industry standard.

This article is one of several we have written that analyze the current status of the wireless data communications industry, criticize WAP, and present our view of what is truly needed to promote the growth of the industry. Related articles are:

- *The WAP Trap* [4]. Provides a critique of the WAP specification, and sets the stage for the current paper. Available at http://www.freeProtocols.org/wapTrap.
- *The LEAP Manifesto* [3]. Provides a complete analysis of the industry, and a detailed description of the LEAP protocols. Available at http://www.freeProtocols.org/eaps.

2 LEAP: The Lightweight and Efficient Application Protocol

The **Lightweight and Efficient Application Protocol**, or **LEAP**, is the general framework for a set of high-performance, efficient protocols which are ideal for mobile and wireless applications. LEAP is designed to address all the technical requirements of the wireless data communications industry, and is oriented towards providing the greatest benefit to the industry and the consumer.

The LEAP protocols are patent-free, and open-source implementations of the protocols are available for a variety of devices and message-center platforms. The protocols are thus ready and available, and can be quickly distributed and implemented as a viable alternative to WAP.

2.1 A Brief History of LEAP

LEAP originated in 1994 as part of the research and development initiatives of McCaw Cellular's wireless data group (now AT&T Wireless). At that time McCaw Cellular was fully committed to paging, had recently purchased two nationwide narrowband wireless PCS licenses, and wished to develop an efficient wireless message transport and delivery system. Neda Communications, Inc., an independent consulting company working under contract to McCaw Cellular, played a significant role in the development of the required system. Neda Communications had also been involved from the outset in the development of the CDPD specification.

In 1997 however, soon after the purchase of McCaw Cellular by AT&T, the company abandoned narrowband PCS paging altogether. Prior to this event, Neda Communications had secured from AT&T the necessary rights to continue independent development of the protocols. Therefore, recognizing the eventual future need for these protocols, Neda then undertook to continue development of the protocols independently of AT&T. They were eventually completed by Neda, published as RFCs, and now form the cornerstone of the LEAP protocols.

2.2 Technical Overview of LEAP

In this section we will provide a brief technical overview of the LEAP protocols. For a detailed description of LEAP, refer to *The LEAP Manifesto* at http://www.freeProtocols.org/eaps.

LEAP is a set of wireless application protocols that are optimized for delivering small messages over wireless networks. Wireless networks are constrained by bandwidth limitations, and the hand-held devices they serve are constrained by limitations such as display size, battery capacity, and memory capacity. These constraints place a high premium on the efficiency of data transfer.

The LEAP protocols are up to five time more efficient than the ubiquitous SMTP e-mail messaging protocols. This increased efficiency translates into longer battery life for mobile phones, PDAs and other wireless Internet devices.

2.2.1 Layering of LEAP

The LEAP protocols are layered. The lower layer, called Efficient Short Remote Operation (ESRO), provides reliable connectionless transport services which can be used for a variety of applications. For example, in addition to mobile messaging services, ESRO can be used as a transport service for credit card verification applications and efficient micro browsers. On top of ESRO is the layer called EMSD. EMSD is a messaging protocol that is highly optimized for the submission and delivery of short internet mail messages.

2.2.2 ESRO, Efficient Short Remote Operation

All efficient applications have the requirement for an efficient transport mechanism. For this reason, the initial focus of the protocol development effort has been on creating a general efficient transport mechanism.

The resulting protocol is referred to as Efficient Short Remote Operations, or ESRO. ESRO is a reliable connectionless transport mechanism, forming the foundation for the development of efficient protocols when TCP is too much and UDP is too little.

2.2.3 EMSD, Efficient Mail Submission and Delivery

The Efficient Mail Submission and Delivery (EMSD) protocol is built on top of ESRO, and is designed to address the Mobile Messaging application.

2.2.4 Initial Focus: Mobile Messaging

The need for efficient protocols extends across all aspects of wireless data communications, including e-mail, web browsing, and other applications. The LEAP architecture accommodates all of these applications. The initial LEAP protocols, however, are designed to support the mobile messaging application, since this is the dominant application for wide-area wireless networks.

2.3 Processes and Procedures

2.3.1 RFC Publication

Both protocols have been published as Internet RFCs; ESRO in September 1997 as RFC-2188 [2], and EMSD in March 1999 as RFC-2524 [1]. RFC publication is the mainstream Internet publishing procedure, ensuring that the protocols are freely, easily and permanently accessible to anyone who wishes to use them.

2.3.2 Freedom from Patents

As discussed in *The WAP Trap*, a highly desirable attribute of an industry standard protocol is that it be free from patents. The presence of patented components within a protocol undermines the ultimate purpose of the protocol: its unrestricted adoption and usage.

Neda has declared to the Free Protocols Foundation that the LEAP protocols are patent-free to the best of its knowledge, and that it intends to keep them patent-free permanently.

2.3.3 Open Maintenance Organizations

To provide an open forum for the continued development and maintenance of the LEAP protocols, Neda has established a public organization for each protocol.

The ESRO and EMSD protocols are maintained, respectively, by ESRO.org at http://www.esro.org/, and by EMSD.org at http://www.emsd.org/.

WAP	LEAP
Subject to known patent restrictions	Patent-free
Self-published by the WAP Forum	Published as Internet RFCs
Revisions subject to change without notice	All revisions permanently fixed
Maintained by the WAP Forum	Maintained by open working groups
Re-invention of existing protocols	Efficiency-optimizing extensions to existing protocols
Tailored to mobile phone user interface characteristics	User interface independent
Inherent security vulnerability	Imposes no security assumptions
Inconsistent protocol number assignment	Consistent protocol number assignment
Poor technical design	Good technical design
Initial focus: web browsing	Initial focus: messaging

Table 1: WAP versus LEAP

Each of these organizations allows public review of the respective protocol, and provides mechanisms for the correction and enhancement of the protocol as a result of collective experience.

Any interested person may become a member of these organizations and participate in the further development of the protocols. Participation in the development process is entirely open and non-exclusive; there are no membership fees. The only requirement for membership is that participants must adhere to the principles and procedures of the Free Protocols Foundation, thus ensuring that the protocols remain permanently patent-free.

3 Comparison of LEAP to WAP

In *The WAP Trap*, we enumerated the characteristics of the WAP specifications that make them wholly unfit to be the industry standard. These characteristics are summarized in Table 1, along with the corresponding characteristics of the LEAP protocols.

Patent Restrictions

As noted in *The WAP Trap*, the WAP specifications include patented components. Unlike WAP, the LEAP protocols are entirely patent-free.

Openness of Publication

As noted previously, the LEAP protocols are published as Internet RFCs, ensuring permanent, unrestricted availability of the protocols. The WAP specifications, on the other hand, are self-published by the WAP Forum, and therefore do not carry the same assurances of unrestricted availability. The availability and permanence of the WAP specifications is only as good as that of the WAP Forum itself.

Furthermore, in order to download any particular WAP specification, a user must agree to a license agreement. By contrast, the LEAP protocols may be downloaded and distributed without any licensing restrictions.

In addition, the WAP Forum's publishing philosophy carries no guarantee of stability. As of February 2000, each WAP specification carries on its title page the disclaimer, "This document is subject to change without notice." By virtue of the RFC publication process, on the other hand, individual revisions of the LEAP protocols are permanently fixed.

Openness of Maintenance

LEAP's open maintenance processes are also in sharp contrast to WAP. Participation in the development of the WAP specifications requires payment of the $27,000 WAP Forum membership fee (as of February 2000), and takes place entirely behind closed doors. Unlike WAP, the LEAP protocols are maintained by public maintenance organizations in which anyone is free to participate.

Technical Deficiencies

The WAP protocols also include numerous technical deficiencies. As discussed in *The WAP Trap*, WAP is a broad-scope re-invention of existing protocols. The LEAP protocols, by contrast, consist of a small number of independent protocols that complement existing Internet protocols. Various other technical deficiences of WAP, and the corresponding LEAP characteristics, are also listed in Table 1.

Initial Focus

There are also significant conceptual differences between LEAP and WAP, of which we will mention two here. First, LEAP is primarily oriented towards the mobile messaging (i.e. e-mail) application, whereas WAP is primarily oriented towards mobile web browsing. We believe that this represents a serious misunderstanding of the mobile data communications industry on the part of the WAP Forum. Hand-held mobile devices are extremely well-suited to the e-mail application, whereas their severe user interface limitations render them highly ill-suited to web browsing.

Second, LEAP and WAP take very different approaches to the messaging application. The two approaches are largely complementary. The LEAP approach, embodied in the EMSD protocol, is a complete and efficient submission and delivery model. The WAP approach, on the other hand, is a mailbox access and selective message retrieval model.

A consequence of this is that the WAP protocol has several unresolved issues relating to message delivery. For example, the WAP protocol does not support the "push" model of message delivery, in which urgent messages are actively delivered to the recipient. The LEAP protocol, by contrast, fully supports the "push" model.

4 Making LEAP Widespread

Thus far our discussion has been entirely theoretical; we have demonstrated on paper that WAP is not viable, and that LEAP has all the characteristics necessary to displace WAP and become the industry standard. However this is all academic until the protocols are implemented as software and deployed in real world systems.

In order for the LEAP protocols to become widely used, they must be implemented in the form of software solutions that are readily available for deployment by end-users. To this end, Neda has created open-source software implementations of the protocols for most common platforms. Protocol engines are available in the form of portable code which has been ported to a variety of platforms. On the device side, software is available for pagers and cell-phones; hand-held PCs (Windows CE, Palm OS, Palm PC, EPOC) and Palm Pilot; Windows 98, Windows 95, and Windows NT; Pine (UNIX, Windows, DOS). On the message center side, software is available for NT, Solaris, and Linux.

These open-source implementations of LEAP are available as free software at http://www.MailMeAnywhere.org/.

As noted above, the initial emphasis of LEAP is on the mobile messaging application. Protocol engines are only a single component of a bigger picture; in order to provide complete solutions to the user it is necessary to integrate these protocols into other existing pieces of software. To that end Neda has created MailMeAnywhere.org, where fully-integrated solutions in open source format are made available to the user.

Neda will also initially "prime the pump" by providing free subscriber services through ByNumber.net. This will provide initial support for adoption of the protocols by end-user devices. Usage of the protocols among a sufficient number of user devices will then provide the motivation for usage among the message center systems.

5 Other Alternatives to WAP

In this article we have promoted LEAP as one alternative to WAP. An obvious question is: Are there any other alternatives?

A traditional source of Internet protocols is the Internet Engineering Task Force, or IETF. To our knowledge, however, the IETF does not currently have a working group assigned to this task, and so no protocol can be expected from them in the near future. Even if the IETF were to assign a working group to this immediately, it typically takes 18 months to achieve a workable first-draft protocol. This time frame is far

too long to address the industry's immediately pressing need.

Other traditional sources of protocols are private industry, and the academic community. However, thus far a suitable protocol has been forthcoming from neither of these sources. There is general consensus within the industry that an alternative protocol to WAP is required. Apart from LEAP, however, no such protocol has yet been publicly proposed.

To the best of our knowledge, therefore, LEAP is the only viable alternative to WAP.

6 Summary

All the components that are needed to launch LEAP as an industry standard are complete, in place, and ready to go. These components are:

The Protocols Themselves. The protocols are well-designed, meet all the technical requirements of the industry, and are published as RFC-2188 and RFC-2524. The complete text of the RFCs is available at `http://www.rfc-editor.org`.

Freedom from Patents. The protocols have been declared to the Free Protocols Foundation as being permanently patent-free. For more information see `http://www.FreeProtocols.org`.

Open Maintenance Organizations. The protocols are maintained by open and public organizations at `http://www.esro.org`, `http://www.emsd.org`, and `http://www.LeapForum.org`.

Open-Source Software Implementations. These are available for all major platforms and end-user devices. For details see `http://www.MailMeAnywhere.org`.

Free Subscriber Services. Provided to support initial deployment of the protocols in end-user devices. For details see `http://www.ByNumber.net`.

Together, these components represent a complete recipe for the success of LEAP. The protocols themselves are open and immediately available, and open-source implementations of the protocols are free and immediately available.

The combination of free protocols and open-source software is something which has enormous power. It is this combination of factors which has driven the overwhelming success of other industry standards such as Linux and HTML. We believe that this same combination of factors will drive the acceptance of LEAP as the wireless data communications industry standard.

Finally, we do not claim that LEAP is technically ideal – like all engineering solutions it includes compromises. Also, it is not yet a complete solution to the needs of wireless data applications – for example, at present it supports the mobile messaging application only. The web browsing application, though planned as a future implementation, is not yet complete. Furthermore, LEAP is a strategic, long-term engineering solution, and will therefore take longer for the protocol to achieve widespread acceptance within the industry.

What we do claim is that LEAP is a good solution, and that its processes have integrity. Where the LEAP protocols fall short of the industry needs, the open maintenance processes will provide a mechanism by which they can evolve into a better solution.

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